CLAIMS

1. A power converter, comprising:

a circuit board;

a planar transformer physically coupled to the circuit board, the planar transformer comprising a primary side and a secondary side and having at least a first edge and a second edge opposed to the first edge;

a first set of switching devices forming a first full bridge circuit comprising a first, a second, a third and a fourth branch of the first full bridge circuit, at least one switching device in each branch mounted on the circuit board along at least a portion of the first edge of the planar transformer wherein the first and the second branch form a first leg of the first full bridge circuit and the third and the fourth branches form a second leg of the first full bridge circuit, and the switching devices of the first full bridge circuit are linearly arranged and ordered such that the switching devices in the first leg are successively adjacent one another and the switching devices in the second leg are successively adjacent one another; and

a second set of switching devices forming a second full bridge circuit comprising a first, a second, a third and a fourth branch of the second full bridge circuit, at least a first switching device in each branch mounted on the circuit board along at least a portion of the second edge of the planar transformer.

2. The power converter of claim 1 wherein each of the first switching devices of the first, the second, the third and the fourth branches of the first bridge circuit are arranged in a line extending parallel to the first edge of the planar transformer.

3. The power converter of claim 1 wherein the first edge extends along the primary side of the transformer.

4. The power converter of claim 1 wherein each of the first, the second, the third and the fourth branches comprise at least a second switching device electrically coupled in parallel with a respective one of the first switching devices in the same branch of the first full bridge circuit, the second switching devices mounted on the circuit board in a line extending parallel to the first edge of the transformer.

5. The power converter of claim 1 wherein each of the first, the second, the third and the fourth branches of the first full bridge circuit comprise an equal number of switching devices, each of the switching devices in the first, the second, the third and the fourth branches electrically coupled in parallel with each of the other switching devices in the respective one of the branches, the switching devices mounted to the circuit board in parallel lines, where each of the lines comprises one of the switching devices from each of the first, the second, the third and the fourth branches and is parallel to the first edge of the transformer.

6. The power converter of claim 1, further comprising:

a first number of heat sink structures, each of the heat sink structures in the first number of heat sinks proximate a respective one of the switching devices of the first full bridge circuit, at least one of the heat sink structures thermally conductively coupled to at least the primary side of the planar transformer.

7. The power converter of claim 1, further comprising:

a first number of heat sinks, each of the heat sinks in the first number of heat sinks proximate a respective one of the switching devices of the first full bridge circuit, at least one of the heat sinks thermally conductively coupled to at least the primary side of the planar transformer; and

a second number of heat sinks, each of the heat sinks in the second number of heat sinks proximate a respective one of the switching devices of the second

full bridge circuit, at least one of the heat sinks thermally conductively coupled to at least the secondary side of the planar transformer.

8. The power converter of claim 1 wherein the primary side of the planar transformer comprises at least two conductive layers, and at least one of the heats sinks are thermally conductively coupled to at least the two conductive layers of the primary side of the transformer.

9. The power converter of claim 1 wherein the first and the second branch form a first leg of the second full bridge circuit and the third and the fourth branches form a second leg of the second full bridge circuit, and the switching devices of the second full bridge circuit are linearly arranged and ordered such that the switching devices in the first leg are successively adjacent one another and the switching devices in the second leg are successively adjacent one another.

10. A power converter, comprising:

a circuit board;

a planar transformer physically coupled to the circuit board, the planar transformer comprising a primary side and a secondary side and having at least a first edge and a second edge opposed to the first edge; and

a first full bridge circuit comprising a left half upper branch, a left half lower branch, a right half upper branch and a right half lower branch, the left half upper branch comprising at least a first left half upper branch switching device, the left half lower branch comprising at least a first left half lower branch switching device, the right half upper branch comprising at least a first right half upper branch switching device and the right half lower branch comprising at least a first right half lower branch switching device, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device of the first full bridge circuit are carried by the

circuit board in a first primary side line extending parallel to the first edge of the planar transformer.

11. The power converter of claim 10 wherein the first left half upper switching device and the first right half upper switching device are adjacent one another such that there are not intervening switching devices and where the first right half upper switching device and the first right half lower switching device are adjacent one another such that there are no intervening switching devices.

12. The power converter of claim 10 wherein at least one of: a) the first left half upper switching device and the first right half upper switching device of the first full bridge circuit are not immediately adjacent one another along the first primary side line, or b) the first left half lower switching device and the first right half lower switching device of the first full bridge circuit are not immediately adjacent one another along the first primary side line.

13. The power converter of claim 10 wherein the left half upper branch further comprises at least a second left half upper branch switching device electrically coupled in parallel with the first left half upper branch switching device, the left half lower branch further comprises at least a second left half lower branch switching device electrically coupled in parallel with the first left half lower branch switching device, the right half upper branch further comprises at least a second right half upper branch switching device electrically coupled in parallel with the first right half upper branch switching device, and the right half lower branch further comprises at least a second right half lower branch switching device electrically coupled in parallel with the first right half lower branch switching device, each of the second left half upper branch switching device, the second left half lower branch switching device, the second right half upper branch switching device and the second right half lower branch switching device of the first full bridge circuit are carried by the circuit board in a second primary side line

extending parallel to the first primary side line and spaced outwardly therefrom with respect to the first edge of the planar transformer.

14. The power converter of claim 10 wherein the left half upper branch further comprises at least a second and a third left half upper branch switching devices electrically coupled in parallel with the first left half upper branch switching device, the left half lower branch further comprises at least a second and a third left half lower branch switching devices electrically coupled in parallel with the first left half lower branch switching device, the right half upper branch further comprises at least a second and a third right half upper branch switching devices electrically coupled in parallel with the first right half upper branch switching device, and the right half lower branch further comprises at least a second and a third right half lower branch switching devices electrically coupled in parallel with the first right half lower branch switching device, each of the second left half upper branch switching device, the second left half lower branch switching device, the second right half upper branch switching device and the second right half lower branch switching device of the first full bridge circuit are carried by the circuit board in a second primary side line extending parallel to the first primary side line and spaced outwardly therefrom with respect to the first edge of the planar transformer and each of the third left half upper branch switching device, the third left half lower branch switching device, the third right half upper branch switching device and the third right half lower branch switching device of the first full bridge circuit are carried by the circuit board in a third primary side line extending parallel to the second primary side line and spaced outwardly therefrom with respect to the first edge of the planar transformer.

15. The power converter of claim 10, further comprising:

a second full bridge circuit comprising a left half upper branch, a left half lower branch, a right half upper branch and a right half lower branch, the left half upper branch comprising at least a first left half upper branch switching device, the left half

lower branch comprising at least a first left half lower branch switching device, the right half upper branch comprising at least a first right half upper branch switching device and the right half lower branch comprising at least a first right half lower branch switching device, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a first secondary side line extending parallel to the second edge of the planar transformer.

16. The power converter of claim 10, further comprising:

a second full bridge circuit comprising a left half upper branch, a left half lower branch, a right half upper branch and a right half lower branch, the left half upper branch comprising at least one left half upper branch switching device, the left half lower branch comprising at least one left half lower branch switching device, the right half upper branch comprising at least one right half upper branch switching device and the right half lower branch comprising at least one right half lower branch switching device, each of the left half upper branch switching device, the left half lower branch switching device, the right half upper branch switching device and the right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a first secondary side line extending parallel to the second edge of the planar transformer, wherein at least one of: a) the left half upper switching device and the right half upper switching device of the second full bridge circuit are not immediately adjacent one another along the first secondary side line, or b) the left half lower switching device and the right half lower switching device of the second full bridge circuit are not immediately adjacent one another along the first secondary side line.

17. The power converter of claim 10, further comprising:

a second full bridge circuit comprising a left half upper branch, a left half lower branch, a right half upper branch and a right half lower branch, the left half upper

branch comprising at least a first and a second left half upper branch switching devices, the left half lower branch comprising at least a first and a second left half lower branch switching devices, the right half upper branch comprising at least a first and a second right half upper branch switching devices, and the right half lower branch comprising at least a first and a second right half lower branch switching devices, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a first secondary side line extending parallel to the second edge of the planar transformer and each of the second left half upper branch switching device, the second left half lower branch switching device, the second right half upper branch switching device and the second right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a second secondary side line extending parallel to the first secondary side line and spaced outwardly therefrom with respect to the planar transformer.

18. The power converter of claim 10, further comprising:

a second full bridge circuit comprising a left half upper branch, a left half lower branch, a right half upper branch and a right half lower branch, the left half upper branch comprising at least a first, a second and a third left half upper branch switching devices, the left half lower branch comprising at least a first, a second and a third left half lower branch switching devices, the right half upper branch comprising at least a first, a second and a third right half upper branch switching devices, and the right half lower branch comprising at least a first, a second, and a third right half lower branch switching devices, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a first secondary side line extending parallel to the second edge of the planar transformer, each of the second left half upper branch switching

device, the second left half lower branch switching device, the second right half upper branch switching device and the second right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a second secondary side line extending parallel to the first secondary side line and spaced outwardly therefrom with respect to the planar transformer, and each of the third left half upper branch switching device, the third left half lower branch switching device, the third right half upper branch switching device and the third right half lower branch switching device of the second full bridge circuit are carried by the circuit board in a third secondary side line extending parallel to the second secondary side line and spaced outwardly therefrom with respect to the planar transformer.

19. The power converter of claim 10, further comprising:

a housing enclosing the circuit board, the planar transformer and the first full bridge circuit.

20. A method of forming a power converter, the method comprising:

mounting a planar transformer to a circuit board, the planar transformer having a primary, a secondary, and at least a first edge and a second edge; and

mounting at least a first left half upper branch switching device, a first left half lower branch switching device, a first right half upper branch switching device and a first right half lower branch switching device on the circuit board in a line extending parallel to the first edge of the planar transformer, the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device electrically coupled to form a first full bridge circuit electrically coupled to the primary of the planar transformer.

21. The method of claim 20 wherein mounting at least a first left half upper branch switching device, a first left half lower branch switching device, a first right

half upper branch switching device and a first right half lower branch switching device on the circuit board in a line extending parallel to the first edge of the planar transformer comprises mounting at least the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device on the circuit board such that at least one of: a) the first left half upper switching device and the first right half upper switching device of the first full bridge circuit are not immediately adjacent one another along the first primary side line, or b) the first left half lower switching device and the first right half lower switching device of the first full bridge circuit are not immediately adjacent one another along the first primary side line.

22. The method of claim 20, the method further comprising:

mounting at least a first left half upper branch switching device, a first left half lower branch switching device, a first right half upper branch switching device and a first right half lower branch switching device on the circuit board in a line extending parallel to the second edge of the planar transformer, the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device electrically coupled to form a second full bridge circuit electrically coupled to the secondary of the planar transformer.

23. The method of claim 20, the method further comprising:

mounting at least a first left half upper branch switching device, a first left half lower branch switching device, a first right half upper branch switching device and a first right half lower branch switching device on the circuit board in a second line extending parallel to the second edge of the planar transformer, the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device electrically coupled to form a second full bridge circuit electrically coupled to the

secondary of the planar transformer, the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device of the second full bridge circuit mounted to the circuit board such that at least one of: a) the first left half upper switching device and the first right half upper switching device of the second full bridge circuit are not immediately adjacent one another along the second line, or b) the first left half lower switching device and the first right half lower switching device of the second full bridge circuit are not immediately adjacent one another along the second line.

24. A power converter, comprising:

a circuit board;

a planar transformer carried by the circuit board, the planar transformer comprising a primary side of a number of planar primary windings and a secondary side of a number of planar secondary windings;

a first set of switching devices carried by the circuit board and electrically coupled to form a first bridge circuit, the first set of switching devices electrically coupled to the primary side of the planar transformer; and

a first set of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the first set of switching devices, at least a number of the heat sink structures thermally conductively coupled to at least one of the number of planar primary windings.

25. The power converter of claim 24 wherein each of the number of heat sink structures in the first set of heat sink structures is thermally conductively coupled to the respective one of the switching devices in the first set of switching devices.

26. The power converter of claim 24 wherein each of the number of heat sink structures in the first set of heat sink structures is thermally conductively coupled to at least two of the number of planar primary windings.

27. The power converter of claim 24 wherein each of the number of heat sink structures in the first set of heat sink structures is thermally conductively coupled to at least two of the number of planar primary windings via solder.

28. The power converter of claim 24 wherein each of the number of heat sink structures in the first set of heat sink structures is thermally conductively coupled to the respective one of the switching devices via a respective one of a number of spring clips.

29. The power converter of claim 24 wherein each of the number of heat sink structures in the first set of heat sink structures is thermally conductively coupled to the respective one of the switching devices via a respective one of a number of bolts.

30. The power converter of claim 24 wherein the first set of switching devices comprises at least a first left half upper branch switching device, at least a first left half lower branch switching device, at least a first right half upper branch switching device, and at least a first right half lower branch switching device, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device, and the first right half lower branch switching device electrically coupled to one another such that the first bridge circuit is a first full bridge circuit.

31. The power converter of claim 24 wherein the first set of switching devices comprises at least a first and a second left half upper branch switching devices

electrically coupled to one another in parallel, at least a first and a second left half lower branch switching devices electrically coupled to one another in parallel, at least a first and a second right half upper branch switching devices electrically coupled to one another in parallel, and at least a first and a second right half lower branch switching devices electrically coupled to one another in parallel, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device, and the first right half lower branch switching device carried on the circuit board in a first line extending parallel to a first edge of the planar transformer and each of the second left half upper branch switching device, the second left half lower branch switching device, the second right half upper branch switching device, and the second right half lower branch switching device carried on the circuit board in a second line extending parallel to the first line and spaced outwardly therefrom with respect to the first edge of the planar transformer to provide an air flow path between the heat sinks proximate the switching devices in the first line and the heat sinks proximate the switching devices in the second line.

32. The power converter of claim 24 wherein the heat sink structures in the first set of heat sink structures are spaced from one another to provide air flow paths therebetween.

33. The power converter of claim 24, further comprising:

a second set of switching devices carried by the circuit board and electrically coupled to form a second bridge circuit, the second set of switching devices electrically coupled to the secondary side of the planar transformer; and

a second set of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the second set of switching devices, at least a number of the heat sink structures thermally conductively coupled to at least one of the number of planar secondary windings.

34. The power converter of claim 24, further comprising:

a second set of switching devices carried by the circuit board and electrically coupled to form a second bridge circuit, the second set of switching devices electrically coupled to the secondary side of the planar transformer; and

a second set of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the second set of switching devices, at least a number of the heat sink structures thermally conductively coupled to at least one of the number of planar secondary windings, wherein each of the number of heat sink structures in the second set of heat sink structures is thermally conductively coupled to the respective one of the switching devices in the second set of switching devices.

35. The power converter of claim 24, further comprising:

a second set of switching devices carried by the circuit board and electrically coupled to form a second bridge circuit, the second set of switching devices electrically coupled to the secondary side of the planar transformer; and

a second set of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the second set of switching devices, at least a number of the heat sink structures thermally conductively coupled to at least one of the number of planar secondary windings wherein each of the number of heat sink structures in the second set of heat sink structures is thermally conductively coupled to at least two of the number of planar secondary windings.

36. A power converter, comprising:

a circuit board;

a planar transformer carried by the circuit board, the planar transformer comprising a number of planar primary windings and a number of planar secondary windings;

a first set of switching devices carried by the circuit board and electrically coupled to form a circuit, the first set of switching devices electrically coupled to the planar primary windings of the planar transformer;

a second set of switching devices carried by the circuit board and electrically coupled to form a second circuit, the second set of switching devices electrically coupled to the planar secondary windings of the planar transformer; and

a number of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the first and the second sets of switching devices, a first number of the heat sink structures proximate the first set of switching devices thermally conductively coupled to at least one of the number of the planar primary windings and a second number of the heat sink structures proximate the second set of switching devices thermally conductively coupled to at least one of the number of the planar secondary windings.

37. The power converter of claim 36 wherein the planar primary windings and the planar secondary windings are formed as conductive traces on a number of layers forming the circuit board.

38. The power converter of claim 36 wherein each of the number of heat sink structures in the first set of heat sink structures is coupled to at least two of the number of planar primary windings.

39. The power converter of claim 36 wherein each of the number of heat sink structures is thermally conductively coupled to at least two of the number of planar primary windings via solder connections in through holes formed in the circuit board.

40. The power converter of claim 36 wherein each of the number of heat sink structures is thermally conductively coupled to the respective one of the switching devices via a respective one of a number of spring clips.

41. The power converter of claim 36 wherein each of the number of heat sink structures is thermally conductively coupled to the respective one of the switching devices via a respective one of a number of bolts.

42. A method of forming a power converter, the method comprising:

mounting a planar transformer to a circuit board, the planar transformer having a planar primary windings, a secondary planar windings, and at least a first edge and a second edge;

mounting a first set of switching devices to the circuit board, the first set of switching devices coupled to the planar primary windings of the planar transformer;

mounting a second set of switching devices to the circuit board, the second set of switching devices coupled to the planar secondary windings of the planar transformer;

mounting a number of heat sink structures to the circuit board proximate a respective ones of the switching devices in the first and the second sets of switching devices, a first number of the heat sink structures proximate the first set of switching devices thermally conductively coupled to at least one of the number of the planar primary windings and a second number of the heat sink structures proximate the second set of switching devices thermally conductively coupled to at least one of the number of the planar secondary windings.

43. The method of claim 42 wherein mounting a number of heat sink structures to the circuit board comprises thermally conductively coupling each of the number of heat sink structures in the first set of heat sink structures to at least two of the number of planar primary windings and thermally conductively coupling each of the

number of heat sink structures in the second set of heat sink structures to at least two of the number of planar secondary windings.

44. The method of claim 42, further comprising:

providing a thermally conductive physical connection between a number of the heat sink structures and the respective one of the switching devices.